EMI -- T E S T R E P O R T

Test Report No. : T31583-00-02KG	April 04, 2007 Date of issue

Type / Model Name : EAP Family

Product Description : Wireless-LAN-Accesspoint

Applicant : Siemens AG

Address : Östliche Rheinbrückenstr. 50

D-76187 Karlsruhe

Manufacturer : Siemens AG

Address : Östliche Rheinbrückenstr. 50

D-76187 Karlsruhe

Licence holder : Siemens AG

Address : Östliche Rheinbrückenstr. 50

D-76187 Karlsruhe

Test Result according to the standards listed in clause 1 test standards:	**POSITIVE**

Deutscher Akkreditierungs Rat DAR

DAT-P-207/0500

The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test results without the written permission of the test laboratory.

Contents

1 TEST STANDARDS

The tests were performed according to following standards:

FCC Rules and Regulations Part 15 Subpart B - Unintentional Radiators (October 01, 2006)

Part 15, Subpart B, Section 15.107(a)	AC Line conducted emissions
Part 15, Subpart B, Section 15.109(a)	Radiated emissions, general requirements
Part 15, Subpart B, Section 15.111(a)	Antenna power conduction

2 SUMMARY

GENERAL REMARKS:

For the unit EAP are different variants with following applications existing:

Variant	Certification-Name	WLAN Modules	Ethernet	Antennas
V01	EAP-W1-RJ-E1	1	RJ45	2 x R-SMA
V02	EAP-W1-RJ-I1	1	RJ45	1 x intern
V03	EAP-W2-RJ-E2	2	RJ45	4 x R-SMA
V04	EAP-W2-RJ-I2	2	RJ45	2 x intern
V05	EAP-W3-RJ-E3	3	RJ45	6 x R-SMA
V06	EAP-W1-MM-E1	1	optical	2 x R-SMA
V07	EAP-W1-MM-I2	1	optical	1 x intern
V08	EAP-W2-MM-E2	2	optical	4 x R-SMA
V09	EAP-W2-MM-I2	2	optical	2 x intern
V10	EAP-W3-MM-E3	3	optical	6 x R-SMA

The used WLAN modules (Atheros AR5414) are compatible with 802.11a, 802.11b and 802.11g modulation.
The WLAN modules are able to operate in 2.4 GHz and 5 GHz on following Frequency bands:

- 802.11a Mode 5.15 GHz – 5.25 GHz and 5.75 GHz – 5.85 GHz
- 802.11b/g Mode 2400 – 2483.5 MHz

The module used DSSS or OFDM modulation and is cabable to provide following data rates:

- 802.11b Mode 11, 5.5, 2, 1 Mbps, auto-fallback
- 802.11g Mode 54, 48, 36, 24, 18, 12, 9, 6 Mbps, auto-fallback
- 802.11g turbo Mode 108, 96, 72, 54, 48, 36, 24, 18, 12 Mbps, auto-fallback
- 802.11a 54, 48, 36, 24, 18, 12, 9, 6 Mbps, auto-fallback
- 802.11a turbo Mode 108, 96, 72, 54, 48, 36, 24, 18, 12 Mbps, auto-fallback

There are different external antennas provided, which are listed in following table:

Number	Characteristics	Certification name	Connection	Frequency	Gain
1*	Omni	ANT795-6MN	N	2,4 GHz band 5 GHz bands	6dBi 8dBi
2	Omni	ANT792-6MN	N	2,4 GHz band	6 dBi
3	Omni	ANT793-6MN	N	5 GHz bands	5 dBi
4*	Patch	ANT795-6DN	N	2,4 GHz band 5 GHz bands	9 dBi 9 dBi
5	Directed	ANT792-8DN	N	2,4 GHz band	14 dBi
6	Directed	ANT793-8DN	N	5 GHz bands	18 dBi
7	Helix	ANT792-4DN	N	2,4 GHz band	4 dBi
8	Λ5/8	ANT793-4MN	N	5 GHz band	6 dBi
9	R-Coax	IWLAN Rcoax PE 1/2" 2,4 GHz	N	2,4 GHz band	0 dBi
10	R-Coax	IWLAN Rcoax PE 1/2" 5 GHz	N	5 GHz band	0 dBi
11*	Patch	A5E00982361	R-SMA	2,4 GHz band 5 GHz bands	3 dBi 3,5 dBi
12*	Patch	A5E00982362	R-SMA	2,4 GHz band 5 GHz bands	3 dBi 3,5 dBi

*) marked antennas are dual band antennas which can be used both in 2.4 GHz and 5 GHz bands.

Following channels are provided to this EUT:

Operation in 2400 – 2483.5 MHz band:

802.11b/g mode:

Channel	Frequency	Channel	Frequency
1	2412 MHz	7	2442 MHz
2	2417 MHz	8	2447 MHz
3	2422 MHz	9	2452 MHz
4	2427 MHz	10	2457 MHz
5	2432 MHz	11	2462 MHz
6	2437 MHz		

802.11g turbo mode:

Channel	Frequency
6	2437 MHz

802.11a mode
Operation in 5750 MHz – 5850 MHz band – ISM band

Channel	Frequency
165	5825 MHz

Operation in 5150 MHz – 5250 MHz (UNII-1) band

802.11a mode:

Channel	Frequency
36	5180 MHz
40	5200 MHz
44	5220 MHz
48	5240 MHz

802.11a turbo mode:

Channel	Frequency
42	5180 MHz

Operation in 5750 MHz – 5828 MHz (UNII-3) band

802.11a mode:

Channel	Frequency
149	5745 MHz
153	5765 MHz
157	5785 MHz
161	5805 MHz

802.11a turbo mode:

Channel	Frequency
152	5760 MHz
160	5800 MHz

FINAL ASSESSMENT:

The equipment under test **fulfills** the EMI requirements cited in clause 1 test standards.

Date of receipt of test sample : acc. to storage records

Testing commenced on : 22. March 2007

Testing concluded on : 23. March 2007

Checked by:

Thomas Weise
Ich bestätige die Richtigkeit und Integrität dieses Dokuments
2007.04.04 14:50:35 +02'00'

Thomas Weise
Dipl.-Ing.(FH)
Laboratory Manager

Tested by:

Klaus Gegenfurtner
Ich bin der Verfasser dieses Dokuments
2007.04.04 14:49:43 +02'00'

Klaus Gegenfurtner
Dipl.-Ing.(FH)

3 EQUIPMENT UNDER TEST

3.1 Photo documentation of the EuT – Detailed photos see Attachment A

3.2 Power supply system utilised

Power supply voltage : 48 V DC

3.3 Short description of the Equipment under Test (EuT)

Industrial Outdoor Access Point (iOAP) with integrated WLAN-Mini PCI cards which can operates both in the 2.4 GHz and in the 5 GHz bands.

Number of tested samples: 1
Serial number EAS: Prototype

EuT operation mode:

The equipment under test was operated during the measurement under the following conditions:

- Continuous transmit mode of 1 module

EuT configuration:

(The CDF filled by the applicant can be viewed at the test laboratory.)

The following peripheral devices and interface cables were connected during the measurements:

- PSU (Power Supply Unit) GlobTek Model : GT-2S5024D-R, S/N RoHS00984803/06
- DC Power supply 48VDC Model : 6000A
- Model :
- Model :
- Model :
- Model :

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

mikes-testingpartners gmbh
Ohmstrasse 2-4
94342 Strasskirchen
Germany

4.2 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Temperature:	15-35 ° C
Humidity:	30-60 %
Atmospheric pressure:	86-106 kPa

4.3 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4-2 /11.2003 „Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements“ and is documented in the quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

4.4 Measurement Protocol for FCC, VCCI and AUSTEL

4.4.1 GENERAL INFORMATION

4.4.1.1 Test Methodology

Conducted and radiated disturbance testing is performed according to the procedures in International Special Committee on Radio Interference (CISPR) Publication 22, European Standard EN 55022 as shown under section 1 of this report.

In compliance with 47 CFR Part 15 Subpart A Section 15.38 testing for FCC compliance may be done following the ANSI C63.4-2003 procedures and using the CISPR 22 Limits.

4.4.1.2 Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral using the appropriate impedance characteristic or left unterminated. Where appropriate, cables are manually manipulated with respect to each other thus obtaining maximum disturbances from the unit.

4.4.2 DETAILS OF TEST PROCEDURES

4.4.2.1 General Standard Information

The test methods used comply with CISPR Publication 22, EN 55022 - " Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement" and with ANSI C63.4-2003 - "Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz" and with RSS-Gen "General Requirements and Information for the Certification of Radiocommunication Equipment".

5 TEST CONDITIONS AND RESULTS

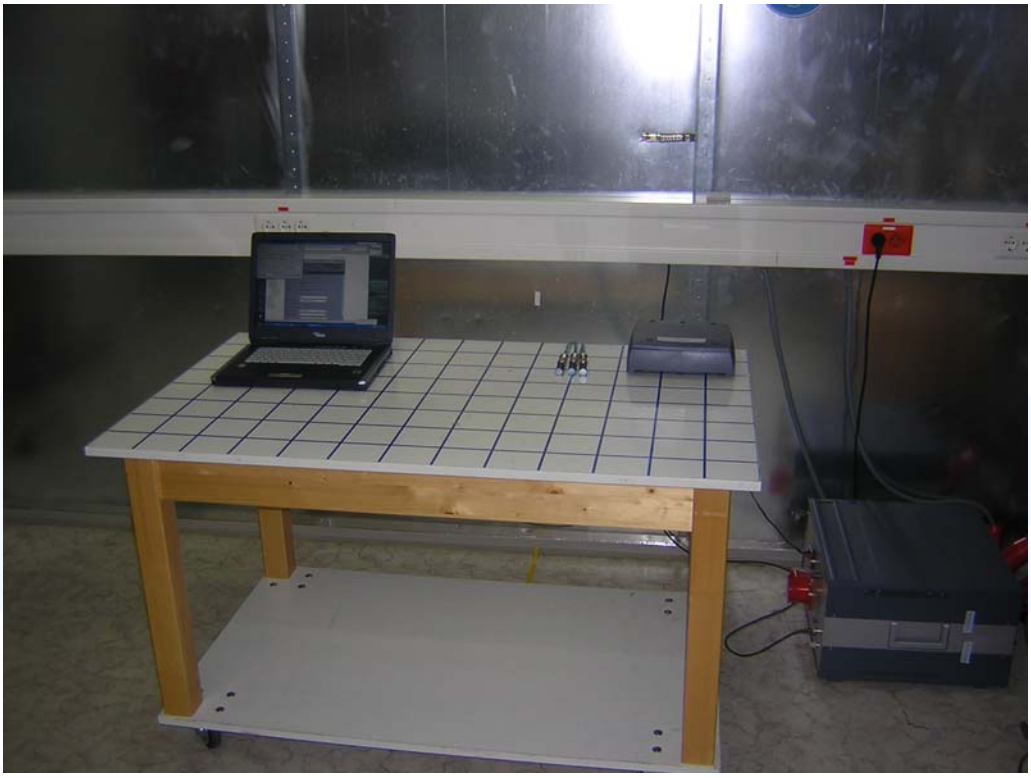
5.1 Power Line conducted emissions

For test instruments and accessories used see section 6 Part **A 4**.

5.1.1 Description of the test location

Test location: Shielded room S2

5.1.2 Photo documentation of the test set-up



5.1.3 Description of Measurement

The final level, expressed in dBμV, is arrived at by taking the reading directly from the EMI receiver. This level is compared directly to the FCC Limit or to the CISPR limit.

To convert between dBμV and μV, the following conversions apply:

dBμV = 20(log μV)

μV = Inverse log(dBμV/20)

Conducted emissions on the 50 Hz and/or 60 Hz power interface of the EuT are measured in the frequency range of 150 kHz to 30 MHz. The measurements are performed using a receiver, which has CISPR characteristic bandwidth and quasi-peak detection and a Line Impedance Stabilization Network (LISN) with 50Ω/50 μH (CISPR 16) characteristics. Table top equipment is placed on a non-conducting table 80 centimeters above the floor and is positioned 40 centimeters from the vertical ground plane (wall) of the screen room. If the minimum limit margin appears to be less than 20 dB with a peak mode measurement, the emissions are remeasured using a tuned receiver with quasi-peak and average detection and recorded on the data sheets.

5.1.4 Test result

Frequency range: 0.15 MHz - 30 MHz

Min. limit margin 10.9 dB at 0.155 MHz

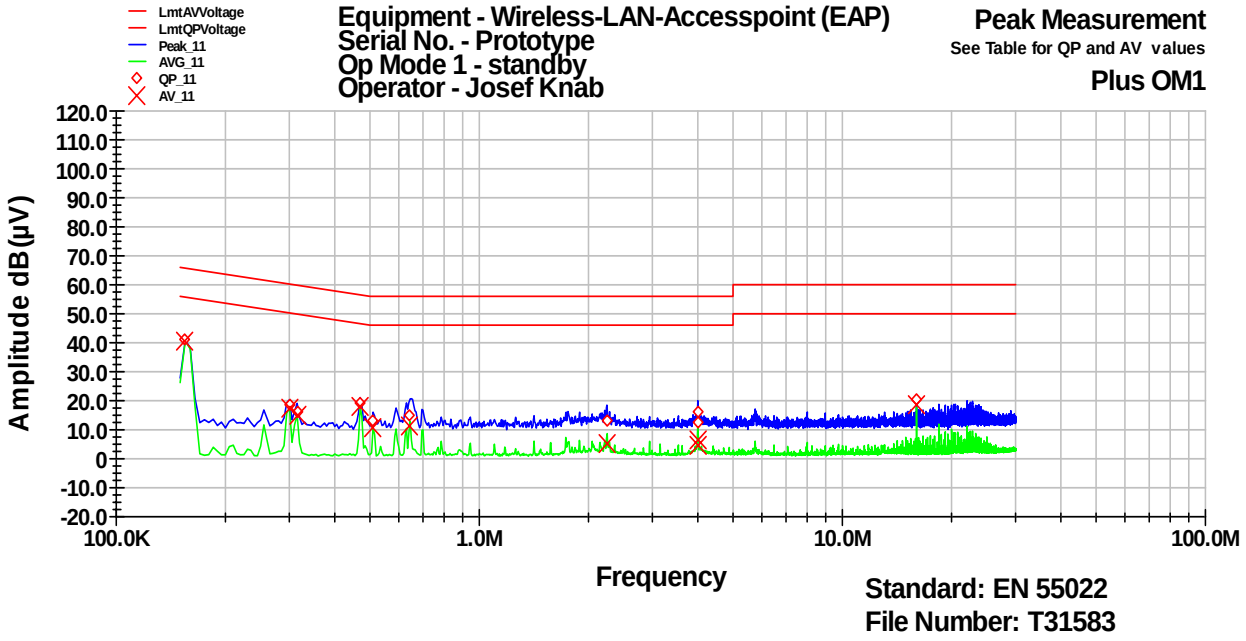
The requirements are **FULFILLED.**

Remarks: As worst case model an EAP variant with 3 connected WLAN modules was tested.

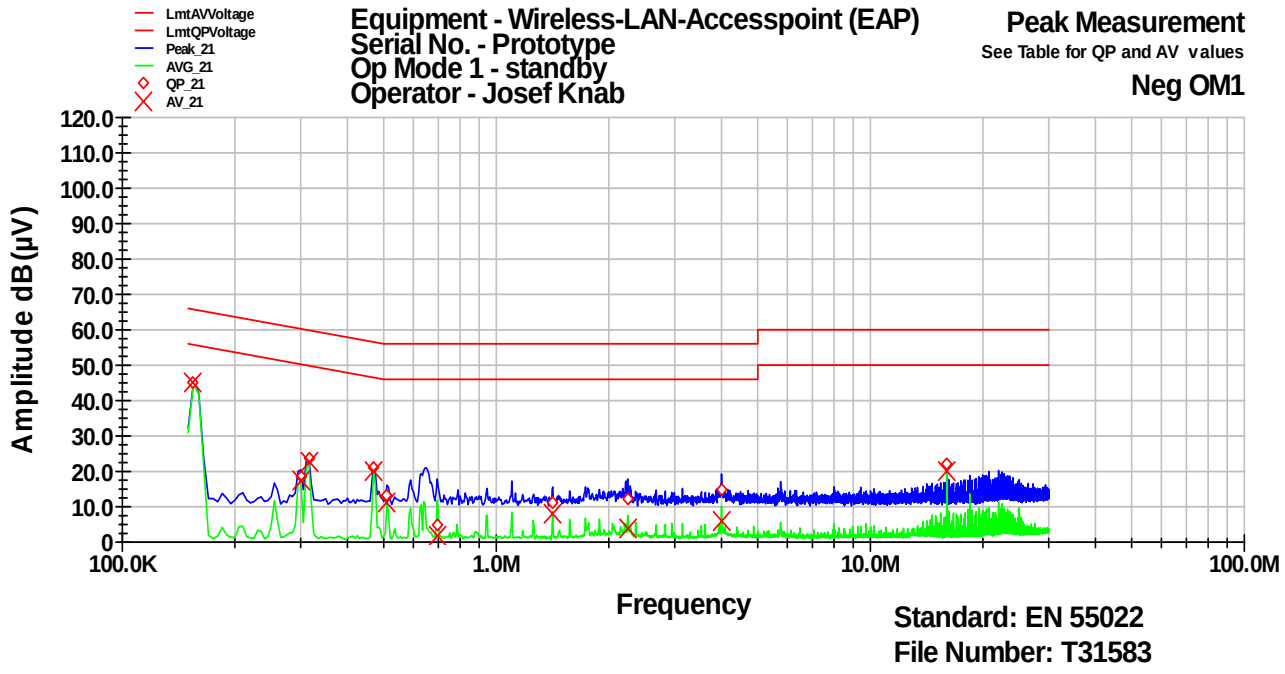
For the test all 3 modules transmitted with full power at the same time. The test were performed

without a connected antenna. The antenna ports were terminated with specific load (50 Ω)

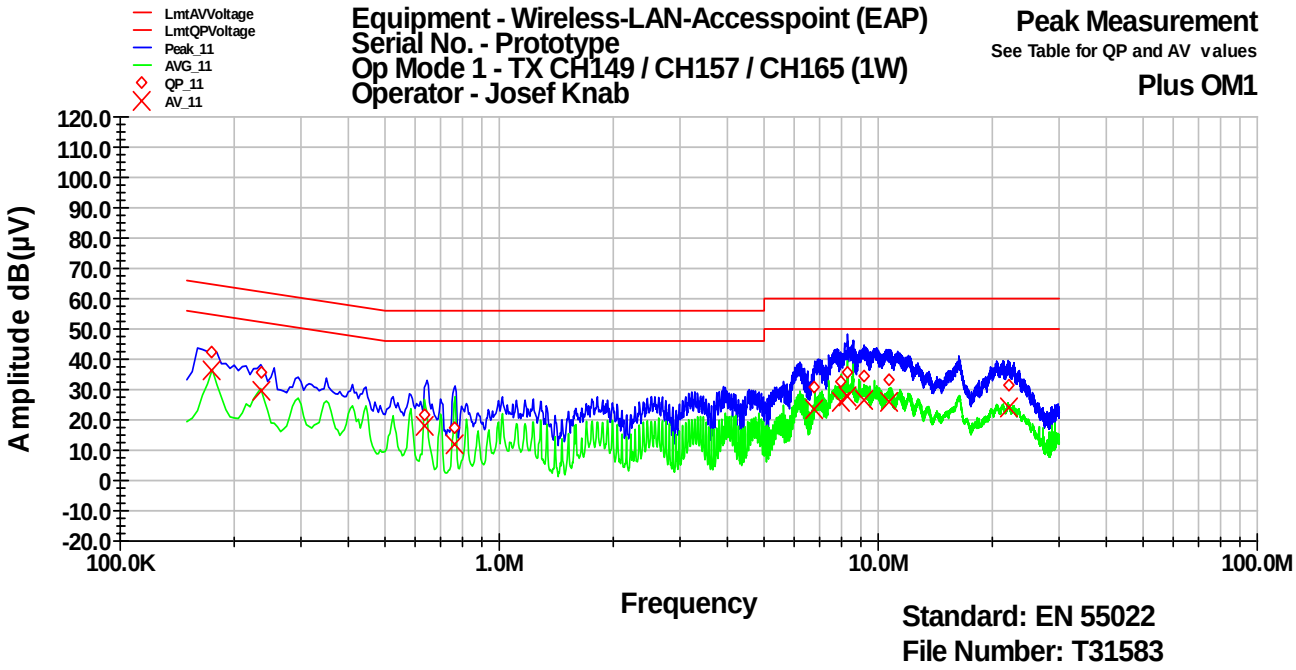
5.1.5 Test protocol



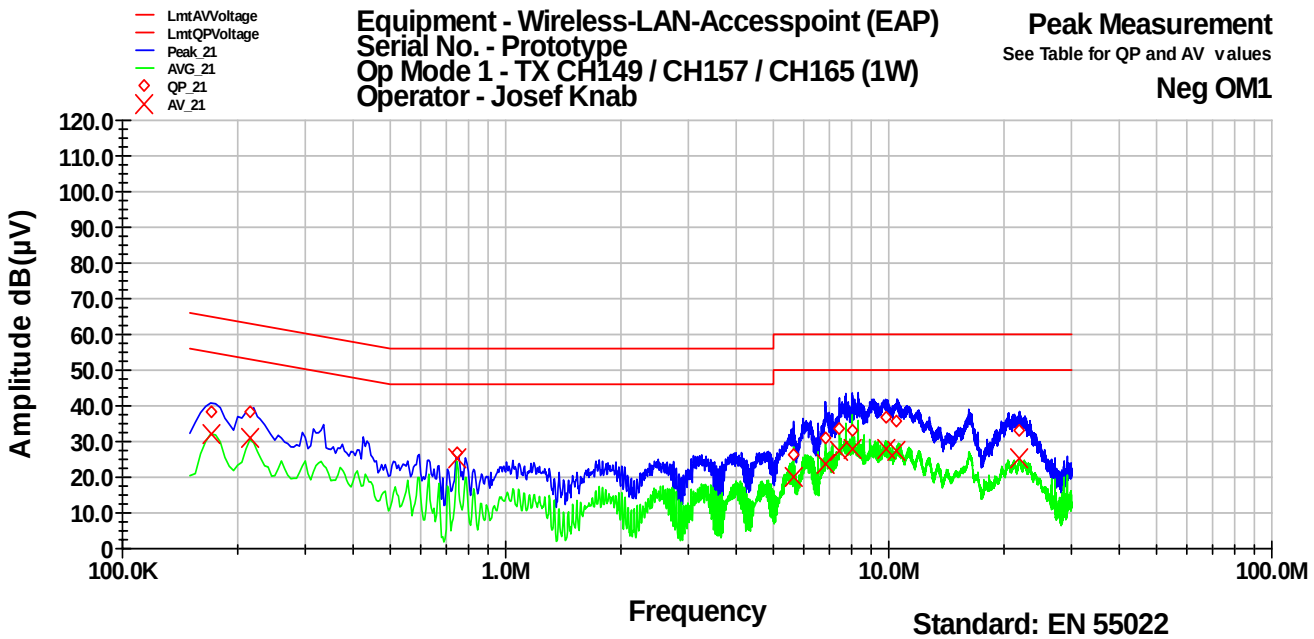
Frequency	QP Level	QP Margin	QP Limit	AV Level	AV Margin	AV Limit
MHz	dB(µV)	dB	dB	dB(µV)	dB	dB
0.155	40.9	-24.8	65.7	40.7	-15.1	55.7
0.3	18.6	-41.6	60.2	17.4	-32.9	50.2
0.315	16.4	-43.4	59.8	14.9	-34.9	49.8
0.47	19.1	-37.4	56.5	17.8	-28.7	46.5
0.51	13.2	-42.8	56.0	10.8	-35.2	46.0
0.645	14.9	-41.1	56.0	11.2	-34.8	46.0
2.25	13.3	-42.7	56.0	5.0	-41.0	46.0
4	15.9	-40.0	56.0	6.4	-39.6	46.0
4.005	12.7	-43.3	56.0	4.7	-41.3	46.0
16	20.4	-39.6	60.0	18.4	-31.6	50.0



Frequency	QP Level	QP Margin	QP Limit	AV Level	AV Margin	AV Limit
MHz	dB(µV)	dB	dB	dB(µV)	dB	dB
0.155	45.2	-20.6	65.7	44.8	-10.9	55.7
0.3	18.6	-41.6	60.2	17.3	-32.9	50.2
0.315	23.7	-36.2	59.8	22.9	-26.9	49.8
0.47	21.3	-35.2	56.5	20.3	-26.2	46.5
0.51	13.2	-42.8	56.0	10.9	-35.1	46.0
0.695	5.1	-50.9	56.0	1.5	-44.5	46.0
1.415	11.0	-45.0	56.0	8.2	-37.8	46.0
2.245	12.2	-43.8	56.0	4.1	-41.9	46.0
4	14.7	-41.3	56.0	5.7	-40.3	46.0
16	22.0	-38.0	60.0	20.0	-30.0	50.0



Frequency	QP Level	QP Margin	QP Limit	AV Level	AV Margin	AV Limit
MHz	dB(µV)	dB	dB	dB(µV)	dB	dB
0.175	42.6	-22.1	64.7	36.6	-18.1	54.7
0.235	35.5	-26.7	62.3	29.7	-22.6	52.3
0.635	21.8	-34.2	56.0	18.0	-28.0	46.0
0.765	17.4	-38.6	56.0	12.0	-34.0	46.0
6.805	30.9	-29.1	60.0	23.3	-26.7	50.0
7.99	32.4	-27.6	60.0	26.2	-23.8	50.0
8.285	35.5	-24.5	60.0	27.5	-22.5	50.0
9.165	34.6	-25.4	60.0	26.5	-23.5	50.0
10.66	33.5	-26.5	60.0	25.6	-24.4	50.0
22.005	31.7	-28.3	60.0	23.9	-26.1	50.0



Frequency	QP Level	QP Margin	QP Limit	AV Level	AV Margin	AV Limit
MHz	dB(µV)	dB	dB	dB(µV)	dB	dB
0.17	38.3	-26.7	65.0	31.8	-23.1	55.0
0.215	38.2	-24.8	63.0	31.0	-22.0	53.0
0.745	27.1	-28.9	56.0	25.2	-20.8	46.0
5.645	26.3	-33.7	60.0	20.2	-29.8	50.0
6.82	30.8	-29.2	60.0	23.5	-26.5	50.0
7.43	33.4	-26.6	60.0	27.3	-22.7	50.0
8.025	33.1	-26.9	60.0	27.7	-22.3	50.0
9.805	36.5	-23.5	60.0	27.8	-22.2	50.0
10.505	35.7	-24.3	60.0	27.1	-22.9	50.0
21.935	33.0	-27.0	60.0	25.2	-24.8	50.0

5.2 Radiated emissions (electric field)

For test instruments and accessories used see section 6 Part **SER 2, SER 3**.

5.2.1 Description of the test location

Test location:	OATS1
Test location:	Anechoic Chamber A2
Test distance:	10 metres (30-1000MHz)
Test distance:	3 metres (1000-2000)

5.2.2 Photo documentation of the test set-up

5.2.3 Description of Measurement

Radiated emissions from the EuT are measured in the frequency range of 30 MHz to 1000 MHz using a tuned receiver and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003.
The Interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna was positioned 3, 10 or 30 meters horizontally from the EuT. To locate maximum emissions from the test sample the antenna is varied in height from 1 to 4 meters, measurement scans are made with both horizontal and vertical antenna polarization`s and the EuT are rotated 360 degrees.

The final level, expressed in dBµV/m, is arrived by taking the reading from the EMI receiver (Level dBµV) and adding the correction factors and cable loss factor (Factor dB) to it. This is done automatically in the EMI receiver, where the correction factors are stored. This result then has the FCC or CISPR limit subtracted from it to provide the Delta which gives the tabular data as shown in the data sheets at page.

The radiated emissions from the EuT are measured in the frequency range of 1 GHz to maximum frequency as specified in section 15.33, using a tuned receiver (Spectrum Analyser) and appropriate linearly polarized antennas. Table top equipment is placed on a 1.0 X 1.5 meter non-conducting table 80 centimetres above the ground plane. Floor standing equipment is placed directly on the turntable/ground plane. The set up of the Equipment under test will be in accordance to ANSI C63.4-2003.
The Interface cables that are closer than 40 centimetres to the ground plane are bundled in the center in a serpentine fashion so they are at least 40 centimetres from the ground plane. Cables to simulators/testers (if used in this test) are routed through the center of the table and to a screen room located outside the test area. The antenna was positioned 3 horizontally from the EuT.

Measurement are made in both the horizontal and vertical planes of polarization in a fully anechoic room using a spectrum analyzer with the detector function set to peak and resolution as well as video bandwith set to 1 MHz. All tests are performed at a test-distance of 3 meters. Hand-held or body-worn devices are rotated through three orthogonal axes to determine which attitude and configuration procedure the highest emission relative the limit and therefore shall be used for final testing. During the tests the EUT is rotated all around to find the maximum levels of emissions. The cables and equipment were placed and moved within the range of position likely to find their maximum emissions. When the EuT is larger than the beamwidth of the measuring antenna, the measurement antenna will be moved over the surfaces for the four sides or the test distance will be reduced to demonstrate that emissions were at maximum at the limit distance.

The resolution bandwidth during the measurement is as follows:
30 MHz – 1000 MHz: ResBW: 120 kHz
Above 1000 MHz ResBW: 1 MHz

5.2.4 Test result

Testresult in detail:(<1GHz)

Frequency [MHz]	Bandwidth [kHz]	L: QP [dBµV/m]	Limit [dBµV/m]	Delta [dB]
125.0	120	25.6	30	-4.6
151.5	120	23.8	30	-6.2
328.6	120	25.6	37	-11.4
331.5	120	24.7	37	-12.3
363.0	120	32.0	37	-5.0
462.0	120	34.0	37	-3.0

Testresult in detail:(>1GHz)

Frequency [MHz]	L: PK [dBµV]	L: AV [dBµV]	Bandwidth [kHz]	Correct. [dB]	L: PK [dBµV/m]	L: AV [dBµV/m]	Limit PK [dBµV/m]	Limit AV [dBµV/m]	Delta [dB]
1056	72.1	53.7	1000	-13.9	58.2	39.8	74.0	54.0	-14.1
1316	69.4	45.5	1000	-14.3	55.1	31.2	74.0	54.0	-18.9
1588	62.3	41.8	1000	-13.8	48.5	28.0	74.0	54.0	-25.5
1719	65.4	42.0	1000	-13.0	52.4	29.0	74.0	54.0	-21.5

Limit according to CISPR 22 and FCC Subpart 15.209 (a)

Frequency [MHz]	15.109 Limits [dBµV/m]
30-230	30 (QP)
230-1000	37 (QP)
Above 960	54(QP) ; 74(PK)

The requirements are **FULFILLED.**

Remarks: According to FCC Part 15.33(b), the measurement was performed up to 2000 MHz.

5.3 Spurious emissions (Antenna Conducted)

For test instruments and accessories used see section 6 Part **SEC 2, SEC 3**.

5.3.1 Description of the test location

Test location:

5.3.2 Photo documentation of the test set-up

5.3.3 Test result

Testresult in detail:

SPURIOUS EMISSIONS LEVEL [dBm]								
CH1			CH2			CH3		
f[MHz]	Bandwidth [kHz]	Level [dBm]	f[MHz]	Bandwidth [kHz]	Level [dBm]	f[MHz]	Bandwidth [kHz]	Level [dBm]
Measurement uncertainty			± 3 dB					

Bandwidth [kHz]; refers to the bandwidth of the measuring receiver

Limit according to FCC Subpart 15.111(a)

Frequencies 30 - 2000 MHz
2.0nW (-57dBm)

The requirements are

Remarks: Not applicable, because the unit has no Receive mode.

6 USED TEST EQUIPMENT AND ACCESSORIES

All test instruments used, in addition to the test accessories, are calibrated and verified regularly.

The calibration intervals and the calibration history will be given out on request.

Test Report No: T31583-00-02KG
Beginning of Testing: 22 März 2007
End of Testing: 23 März 2007

Test ID	Model Type	Kind of Equipment	Manufacturer	Equipment No.
A 4	ESHS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-002
	NNLK 8129	LISN	Schwarzbeck Mess-Elektronik	02-02/20-05-001
	ESH 2 - Z 5	LISN	Rohde & Schwarz München	02-02/20-05-004
	ESH 3 - Z 2	Pulse Limiter	Rohde & Schwarz München	02-02/50-05-001
	N-4000-BNC	RF Cable	mikes-testingpartners gmbh	02-02/50-05-138
	N-1500-N	RF Cable	mikes-testingpartners gmbh	02-02/50-05-140
SER 2	ESVS 30	EMI Test Receiver	Rohde & Schwarz München	02-02/03-05-006
	VULB 9168	Trilog-Broadband Antenna	Schwarzbeck Mess-Elektronik	02-02/24-05-005
	S10162-B/+11N-50-10-5/+11N	RF Cable 33m	Huber + Suhner	02-02/50-05-031
	KK-EF393-21N-16	RF Cable 20m	Huber + Suhner	02-02/50-05-033
	NW-2000-NB	RF Cable	Huber + Suhner	02-02/50-05-113
SER 3	AFS4-01000400-10-10P-4	RF Amplifier 1-4 GHz	PARZICH GMBH	02-02/17-05-003
	3117	Horn Antenna 1-18 GHz	EMCO Elektronik GmbH	02-02/24-05-009
	Sucoflex N-1600-SMA	RF Cable	novotronik Signalverarbeitung	02-02/50-05-073
	Sucoflex N-2000-SMA	RF Cable	novotronik Signalverarbeitung	02-02/50-05-075